

ANCIENT STONE MONUMENTS NEAR LOUGH SWILLY, COUNTY DONEGAL, IRELAND.

BY CAPTAIN H. BOYLE SOMERVILLE, R.N., FELLOW.

[Submitted JULY 12, 1909.]

DURING the course of a hydrographic re-survey of Lough Swilly in last autumn (1908), my attention was drawn to the large number of ancient stone remains among the hills bordering the Lough.

Many of these are placed and named as "Antiquities" on the Ordnance Maps (which underwent revision in 1902-3); but there are several of the less prominent ones that have hitherto escaped notice, and are not known even to the country people living near them.

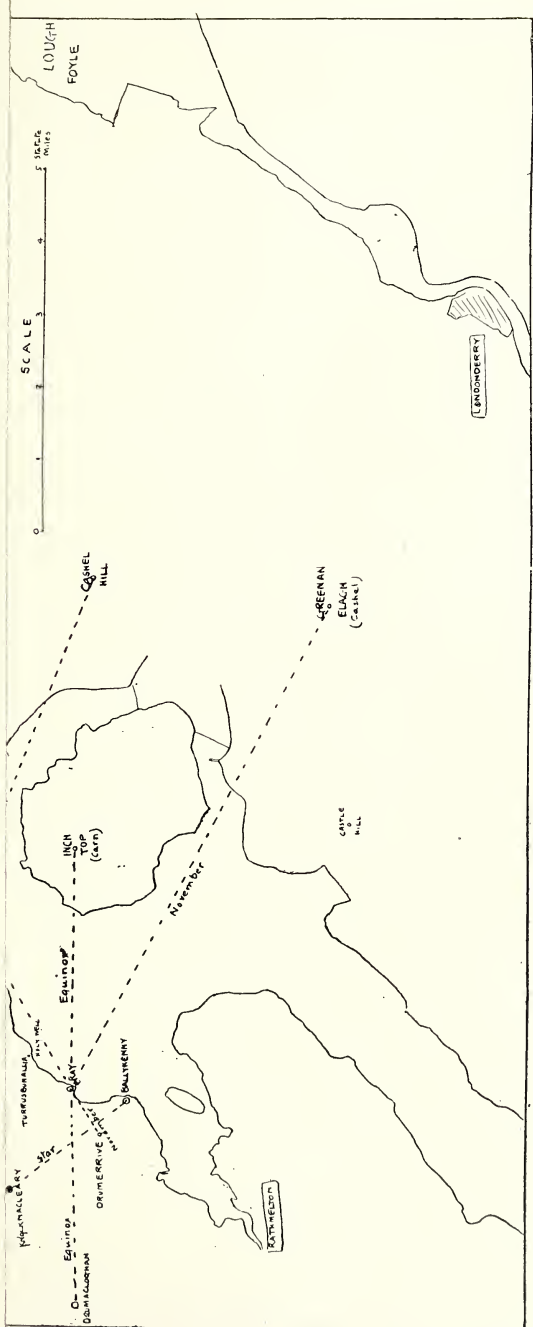
I propose in this paper to enter upon a detailed description of some of these monuments, both the known and the unknown, especially with regard to their orientation. This subject has lately received a new impetus from the researches of Sir Norman Lockyer and others in England and Wales, which have shown, not only that the direction in which the monuments lie is very far from being fortuitous, but that the orientation is their most essential feature—in many cases, possibly, their sole *raison d'être*.

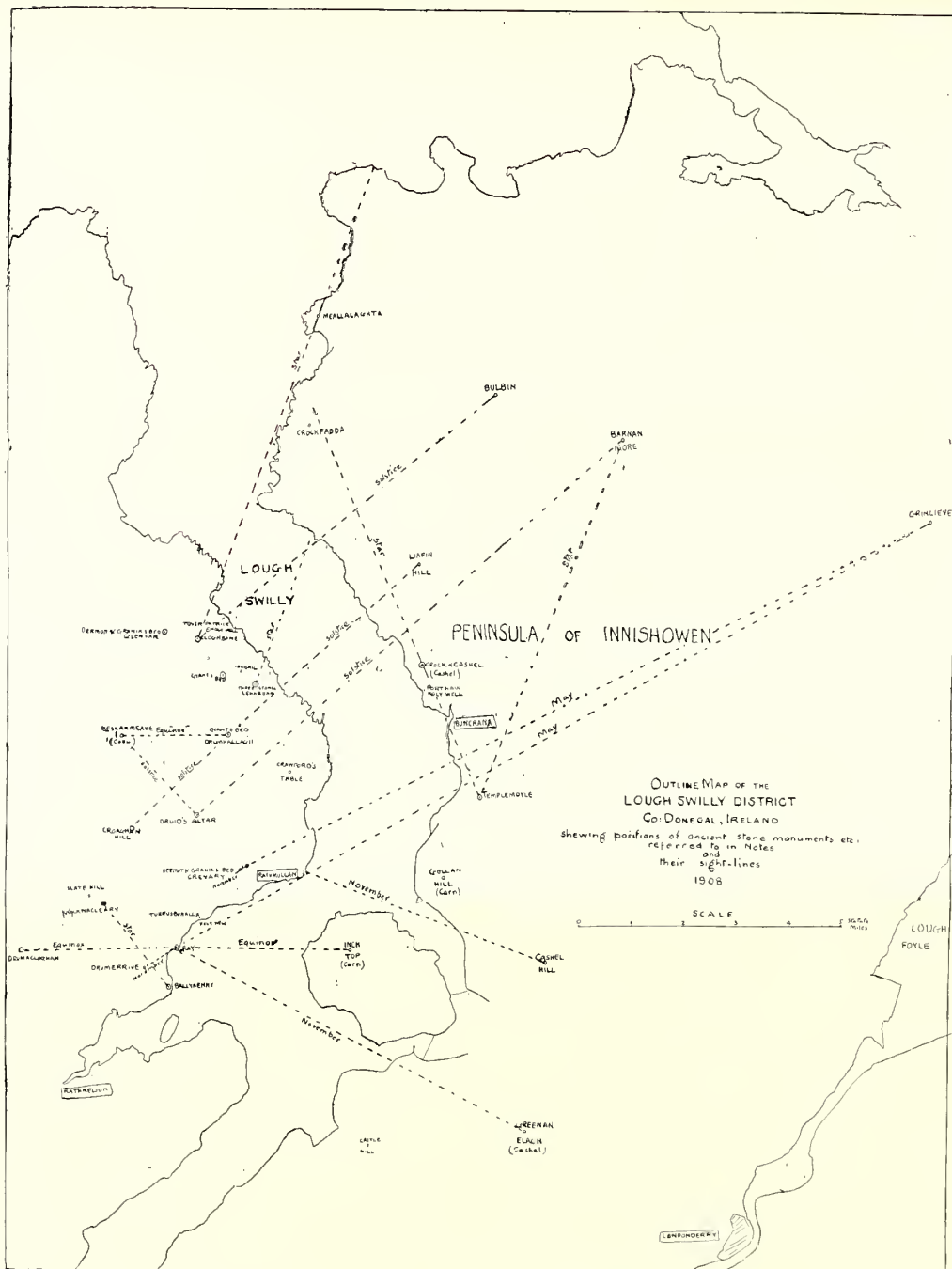
It has become apparent, moreover, that there is more than one system of orientation: that is to say, that some monuments are oriented for solstitial sunrises or sunsets, or both; some for sunrise or sunset at the Equinoxes; some for sunrise or sunset at a point equidistant in time between solstice and equinox (namely at the beginning of May, August, November, and February); some for the rising or setting of a star, or of the Moon.

The monuments around Lough Swilly appear on investigation to have belonged to all these systems or cults; namely, (1) Solstitial, (2) Equinoctial, (3) "May Year," and (4) Stellar, or possibly Lunar.

Judging by the number and variety of scattered remains of antiquity in the neighbourhood, it would appear as if this region had not only been largely populated in ancient days, but was also highly civilized for the period of the world's history, as we know it. The undoubted knowledge of astronomy possessed by its inhabitants infers a degree of civilization far beyond what now remains to us of it in the shape of these rude stone structures, though, at the same time, they do not appear to have acquired the art of writing.

The exact reasons for the monuments requiring these particular orientations are not yet thoroughly ascertained; but it may be said with some degree of certainty that they were both calendrical and religious.





and that, for instance, the arrival of the sunrise at the two extreme azimuths of the Sun's declinational path at midsummer and midwinter were moments indicating not only the turn of the year, but were also seasons for religious praise or worship.

The star azimuths were evidently connected with the same observances, and may also (particularly if the stars were observed in connexion with the moonrise) have presented dates for the beginning of longer periods than an anniversary day, such as Lunar Cycles of 18·6 years. Stars with a high northern declination may also possibly have been used during the half of the year when they were visible at night to denote by their position in the heavens how the dark hours were passing.

METHODS EMPLOYED IN THE LAYING-OUT OF OBSERVATORIES.

The methods employed by the ancients in the laying-out of their sight-lines for making the necessary astronomical observations appertaining to the various cults, vary with the topographical peculiarities of the surrounding country. Thus, in flat country, with a featureless horizon, it would be necessary to erect stones or other structures at *both* ends of the directing line, which indicated the bearing on which the Sun, Moon, or star should rise or set on the appointed day.

In hilly country, on the other hand, advantage would be taken of the best defined and most prominent peaks, so that they might form the farther point of the sight-lines, and that the observatories should be so placed that some particular heavenly body would be seen rising or setting behind their summits.

This is the reason of the seemingly indiscriminate positions of the observatories in hilly countries. Their positions are in reality the result of considerable thought and experiment; for it is, of course, only from a definite spot that, *e.g.*, solstitial sunrise could be seen taking place behind any particular peak on any particular day. A little way to the right or left, and the Sun would not be seen *exactly* over the summit on that day. Thus it will be seen that it could only be by the merest chance that an observatory could be built on one hill-top from which the rising of a heavenly body could be observed on a particular day *exactly* behind a second summit. It follows, therefore, that whenever megalithic remains are found on a hill-top, the probability is that they represent the termination of the sight-line at some observatory at a distance, and are not themselves observatories; and a second spot has then to be sought from which these stones would be seen clear against the sky on one of the azimuths of a rising body proper to the latitude.

The monuments of which I propose to speak in this paper are situated in the hilly country of Donegal, and are all partly of the

mountain-peak sight-line order, though partly, in some cases, of the artificial sight-line class as well. It should be added that these sight-line summits are generally surmounted by a "carn" or artificial mound of stones denoting the burial-place of some chief or notable personage, the high heap in most cases accentuating the position of the exact summit.

While referring to this, I may suggest that part of the religious quality of these ancient observatories may be found in the association of the burial-places of the great departed with the movements of the heavenly bodies. They formed temples from which the spirit of the mighty dead, enshrined in or represented by a heavenly body, might be seen rising to its own place. "*Sic itur ad astra*"; and it may not be altogether fanciful to suggest that our modern conception of the locality of "heaven," the home after death, as being "up in the sky" has here its origin. It may be pointed out that this notion of the place of the departed is not peculiar to Pagan Ireland, but had its roots all over Europe when Christianity sprang up, altering and adapting where it could not eradicate.

The custom of sepulture—"cromlechs" and so forth—near the observatories themselves has often been noted, and shows that there was at least some connexion between the cult of the dead and of the heavens. Even to-day we see graveyards surrounding churches—both church and graves oriented in the same direction.

It seems likely, therefore, that the mountain peak forming the other extreme of an observatory sight-line, and thus being in a sense part of the observatory, was generally, if not always, the sepulchre of some person deserving honour and worship.

Sir Norman Lockyer's book, "*Stonehenge*," and a series of papers by him which appeared recently in "*Nature*," under the title, "*Surveying for Archæologists*," describe the method by which, first, the particular astronomical purpose, and secondly, the age of these ancient monuments, may be determined.

It will suffice here to say that, by combining the azimuth and the altitude of any hill-top or carn, as observed from any other position, with the latitude of the place, it is not difficult to find, by spherical trigonometry, the declination of the heavenly body that would appear rising or setting behind that hill-top or carn.

From this declination we can then determine if the Sun were the object observed, and, if so, at what part of its annual path. It will also show us if a star or the Moon were the object observed, and, in the former case, the actual star and the date at which it had that declination.

The date can also be obtained from the Sun's declination; but only if it is a solstitial declination, and has been determined with great accuracy.

The declinations that I shall give later, when discussing each monument and its sight-line, are, generally speaking, derived from accurate observations by theodolite, and then carefully calculated in the manner described above.

It has been possible to work out each declination with considerable exactness, as I have been able to combine my own angles with the Ordnance azimuths from trigonometrical stations within sight of the monuments.

As the sight-lines dealt with are in nearly every case several miles in length, there is no indefiniteness as to their real existence, especially as they are over sharply defined summits, often crowned with carns; and these considerations have justified the calculations to seconds of an arc, of which I give the results later on.

The question as to which limb of the Sun was employed by the ancients is a matter of conjecture. In the Sun declinations calculated from the Donegal sight-lines, I have worked out each as for a lower-limb observation, as well as for an observation with 2 minutes of the upper limb visible above the mountain top; and I shall refer to what deductions can be made in the matter later on. The point is of importance in the dating of the founding of the observatories, as the difference of about 30 minutes in the altitude (corresponding to the diameter of the Sun) makes a large difference in the deduced declination in any Irish latitude.

A short description of each monument visited will now be given, together with a plan to scale of the more important remains.

An outline map of the whole locality is added, showing the relative positions of each of them, and their sight-lines. In this description the monuments are taken in order of succession from north to south along the western shore of Lough Swilly, followed by an account of the single sight-line investigated on the eastern shore of the Lough. A few remarks are inserted at their proper places on various holy wells and other objects of archaeological interest in the neighbourhood, which, for various reasons, have not been made the subject of scientific survey for orientation, &c.

(FIG. I.)

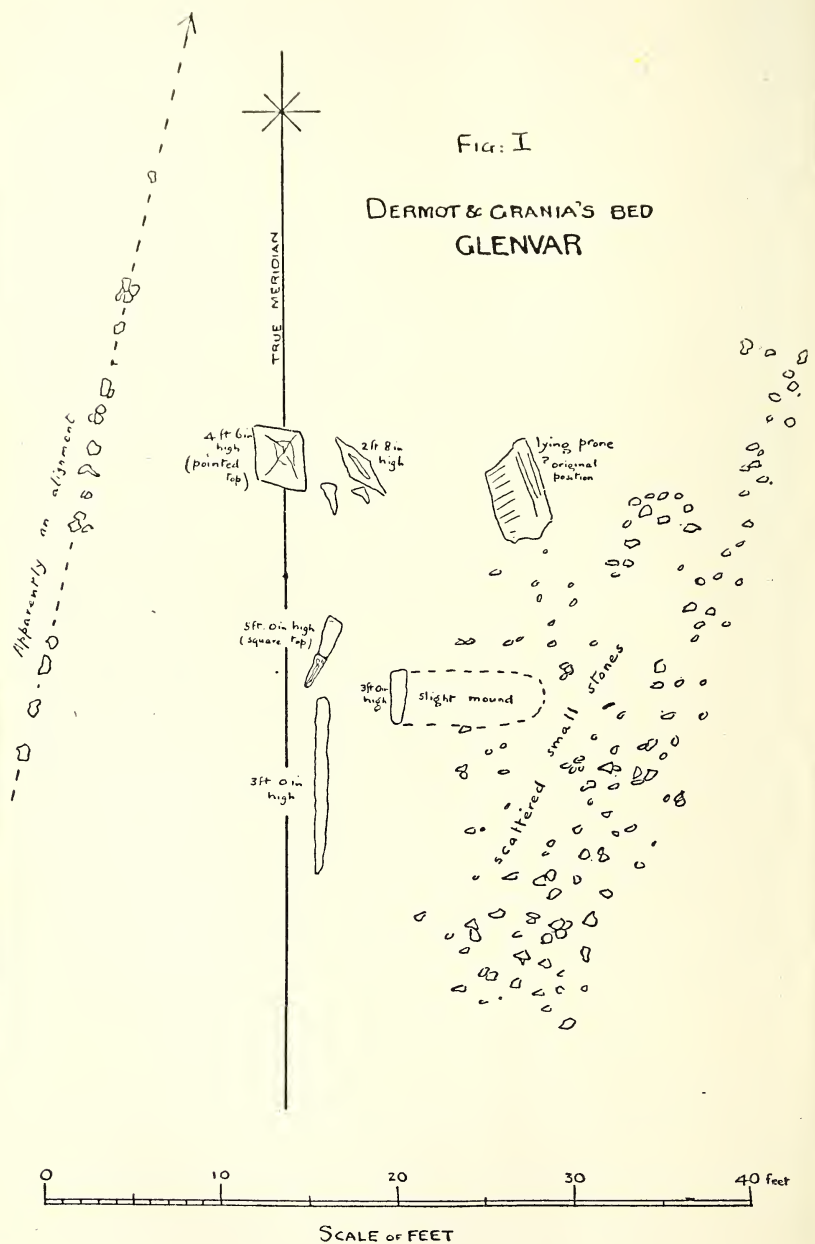
(1) DERMOT AND GRANIA'S BED, GLENVAR.

Two monuments of this name are described in the following notes: one is situated at Glenvar, the other about five miles to the southward, near a farm named Crevary. They differ greatly in all respects, both general character, orientation, and probably in age; and the similarity of name is due merely to modern ignorance of their original purpose, and may be said only to indicate that they are "antiquities."

The Glenvar remains are in a greatly ruined condition; but the owner of the field in which they stand informed me that they certainly

FIG: I

DERMOT & GRANIA'S BED
GLENVAR



had not been interfered with during the last hundred years or so; for both he, his father, and his grandfather, who had successively owned it, had protected every stone religiously.

It is impossible to determine exactly the actual form that the monument originally took; but the stones now standing are placed in a line running due north. There is a slight mound (indicated in the plan) which lies due east from one of the large standing stones. This may be the remains of an ancient burial-place, but its appearance is that of a modern grave.

The eastern side is covered by a confused mass of small stones, with some indication of a straight edging, and has the appearance of being the remains of a small platform or low wall along that side of the monument.

There are decided remains of a stone alignment on the western side of the monument, but running in a different azimuth from the standing stones, namely, $N. 13^{\circ} 02' E.$; and at the elevation of the sky-line seen from it, infers a star's declination of $38^{\circ} 50' 45''$, of which the most probable stars and periods are—Vega, in 100 B.C.; Capella, 500 B.C.; Arcturus, 1600 B.C.

These inferences are, however, not really reliable, as neither extremity of the alignment now remains in position. All that can be said is that $N. 13^{\circ} 02' E.$ is the azimuth of the portion existing, and that the sky-line (which has no particular mark or object to mark a sight-line) is at an elevation of $5^{\circ} 15' 00''$ from the "Bed." This angle would undergo considerable alteration according as the sighting position was changed, for the sky-line is only about half a mile distant; and I may add that the original sighting position in connexion with the monument is now only conjecturable, so that the sight-lines employed have to be guessed at from observations made at the "Bed" itself.

In this connexion, I would remark that there is a row of small cottages known as "Gorteen" ("the little field"), placed at a distance of 200 yards south of the monument. Near these houses, and facing the "Bed," there is growing an ancient thorn-tree. A man of the village, of over eighty years of age, told me that he remembered a still more ancient thorn-tree, which had gradually decayed during his lifetime; and he pointed to the spot close by, where formerly it had grown. A stone wall intervened between it and the stones of the "Bed," obscuring the view; but I see, on protracting the line on the Ordnance Map, that the position is exactly south from the stones, and therefore (being in the line which they themselves occupy) was probably the ancient sighting position for making observations over the monument. I shall refer to this connexion of ancient thorn-trees with the sighting positions of the Donegal monuments later on.

If this thorn-tree were the position from which the observations were made, it would alter to some extent, but not very greatly, the sight-lines as taken from the monument itself. These are as follows:—

NAME OF SUMMIT.	EVENT.	DECLINATION.	
		Upper limb.	Lower limb.
SLIEVEKEERAGH.	Summer solstice sunrise.	25° 06' 06" N.	25° 25' 26" N.
INNISKIL.	November sunrise.	15° 15' 39" S.	14° 46' 55" S.
CROCKNAGLAGGAN (Crawford's Table).	Winter solstice sunrise (doubtful).	25' 10' S.	—
Alignment of stones adjoining the "Bed." ¹	(?) Name of star.	38° 50' 45" N.	

(2.) CLOGHBANE.

("The White Stone": also known as "The Rowan Stone.")

This is a very interesting monument, as it definitely combines both a Sun and star sight-line. It originally consisted of two blocks of white quartz, roughly hewn, and erected one on the top of the other in pillar-form, with a few small stones to keep it firm. It was surrounded by a platform of small stones; but these have been removed within recent years.

I was informed by a young countryman, belonging to the farm on which it stands, that about seven years ago, while he was ploughing, the swingle-tree of the harness struck the top stone; and it fell over on its side on the ground—a position it still occupies. This stone is about 4 feet 6 inches long, and 2 feet in diameter: that on which it formerly rested is still *in situ*, and projects 1 foot 6 inches from the ground; it is of the same girth as the fallen portion.²

It was thus possible to erect the theodolite over its centre; and an unusually accurate observation of the sight-line was obtainable. In

¹ The alignment of the "Bed" itself (standing-stones) is due north.

² The attitude of the country people with regard to these monuments is roughly indicated by the remarks that I heard made by a very old man, and by the young man above referred to, concerning Cloghbane. The old man agreed with me that as the stones had been there for so many years, it would be a pity now to move them. He also hinted at the ill-luck which might follow such a proceeding. "Well, I don't know as to that," said the young man; "but it's an awful bother when you're ploughing." And I dare say it is, too!

the next field to the northward of Cloghbane, at a distance of 700 feet, is a "Calluragh," or burial-place of unbaptized persons. It is roughly circular, and about 50 feet in diameter.

A single lump of white quartz, measuring about 3 feet each way, lies on one side of this mount, and may have been connected with Cloghbane in some way no longer apparent. In the same field, close by, however, there is a fallen pillar-stone (not of white quartz), 6 feet long, 2 feet wide, and 6 inches deep, roughly faced, to which I shall refer presently, which seems to have been part of a sight-line. Several other large stones lie scattered about in its neighbourhood, and are possibly the ruins of some monument.

The outline of the mountains visible to the northward from Cloghbane shows two sight-lines that undoubtedly were used from this position. One is for the summer solstitial sunrise over the prominent peak Bulbin: the other is over a low and small but conspicuous round-topped headland, towards the mouth of the Lough, which is in line with an exactly similar hill behind it; their two summits being practically coincident, forming a single sky-line; so that, from Cloghbane, their angle of elevation by theodolite is the same.

The nearer of these two headlands is named Meallalaghta ("the round-topped hill of the sepulchre"); so that evidently it once was crowned by a carn. The fallen pillar-stone in the field referred to above is exactly on this sight-line from Cloghbane; and, in addition to this indication, I see by the Admiralty chart of 1855 that there then stood a white pillar-stone on the same line on the opposite shore of the Lough. This has now disappeared; but there can be no doubt that it also once formed part of this sight-line.

The inferred declination is that of Arcturus, 450 B.C.; Castor, 850 B.C.; or Capella, 1800 B.C.

As regards the Bulbin sight-line, this peak is one of the most prominent, though not quite the highest, of the hills on the Innishowen peninsula. It seems probable that it may have been named in commemoration of Conall Gulban, son of Niall of the Nine Hostages, King of Ireland from A.D. 379 to 405, i.e. in pagan times, before the arrival of St. Patrick. In Dr. Joyce's work on "Irish Place-Names," p. 140, it is stated that Conall received the cognomen of Gulban from having been fostered near the mountain Binn-Gulbain (Gulban's Peak; now Binbulbin) in Sligo. He died in 464; and though, as Dr. Joyce informs me, he was buried in Fenagh, in the county Leitrim, it seems at least likely that this memorial was kept of him in this, his parent land, though his remains are not buried in it. I have not been able actually to visit the summit in order to see if there are any remains of a carn on it (none appear on the Ordnance map); but the peak is itself a very decided one, as viewed from Cloghbane, and no carn is needed to mark the exact extreme of the sight-line.

The following is a tabulation of the declination of Sun and star sight-lines from Cloghbane :—

NAME OF SUMMIT.	EVENT.	DECLINATIONS.	
		Upper limb.	Lower limb.
(1) BULBIN.	Summer solstice sunrise.	23° 22' 08" N.	23° 49' 56" N.
(2) KNOCKALLA.	Summer solstice sunset.	23° 12' 04" N.	22° 48' 53" N.
(3) INNISKIL.	November sunrise (?).	12° 44' 49" S.	13° 10' 34" S.
(4) (?) name summit.	November sunset.	16° 07' 33" S.	16° 34' 06" S.
(5) AGHAWHEEL.	May sunrise.	18° 58' 04" N.	19° 25' 20" N.
(6) MEALLALAGHTA.	Star rise.	32° 08' 40" N.	—
(7) BINNADREEN.	Star set (?).	35° 43' 12" N.	—

Notes.—(1) The Bulbin sight-line refers to the year 1000 B.C., if the Sun's lower limb was observed; while if the upper limb, the inferred declination is that of four or five days before or after the solstitial day.

(2) Knockalla has a very sharp, decided summit; but there are several other peaks to this ridge, as sharp, if slightly lower; and I have no guarantee that I have chosen the correct one, though I think it is obvious that one was used for the solstitial sunset. The declination for either limb, as obtained, is also short of the solstice by about ten or twelve days.

(3), (4), (5) The November and May sunrises and sunset are somewhat conjectural. These events could have been observed from Cloghbane, over these summits, when the Sun was at the stated declinations; but I have no proof that they were, beyond the inherent probability.

(6) I have no doubt at all about the star rise over Meallalaghta, especially as the same declination for a star was obtained at two other separate monuments in this locality, as I shall show later.

(7) The Binnadreen star-set line is only conjectural; if the Meallalaghta star was used as a clock-star, it would have set behind some part of this hill-top (which is a well-marked one), if not behind the precise summit.

TOBER PATRICK.

Near Cloghbane is Tober Patrick, a small holy well on the side of a sloping field. It is a semicircular depression in the hillside, opening to the eastward, faced with roughly built stone, and a couple

of feet deep. It becomes dry after periods of deficiency of rain, as during the early part of August, 1908.

Standing on the higher side of the well is a large rectangular block of stone with a briar bush growing over it; and a small heap of little stones, the votive offerings of those who use the well, lies on top.

The owner of the field in which it stands, who lives in a small farm cottage close by, told me that lame people and others desiring a "cure" visited the well on St. Patrick's Day to pray and take the waters, often to the number of a hundred persons, and that he had heard that the well had been blessed by St. Patrick himself. There are not now remaining any of the usual "sacred trees" in the vicinity of the well; but the cottage above referred to included in its structure several megaliths, which I have little doubt once formed some part of an ancient circle or other structure.

(3.) STANDING-STONES, LEHARDAN.

These standing stones, now three in number, are on the southern side of Lehardan Hill, above the cultivable part of the slope, and not far from the Ordnance trigonometrical station on the summit.

They are quite isolated, and have no especial name among the country people, beyond "The Standing Stones." They are of the stone of the neighbourhood, and are roughly faced, with flat sides and fairly well determined angles.

By placing the theodolite with the stones in a line at such a height that the tops of all three (which are graduated in height—that furthest up the hill being also the tallest stone) had the same line of elevation (for this seemed to me to be the intention of the alignment), an azimuth and altitude were obtained which produce a declination of a star of $32^{\circ} 37' 15''$ N.

This is obviously the same star as was aligned at Cloghbane just described—namely, for Arcturus, 500 B.C.; Castor, 700 B.C.; Capella, 1750 B.C., and at practically the same dates.

I have not made any further theodolite measurements at this monument; but I see by protraction from the Ordnance map that the winter solstice sunrise might have been observed from it over the cairn on Gollan Hill, above Fahan, on the opposite shore of the Lough; the winter solstice sunset over a summit named Craighadda, not far from Lehardan; and possibly the equinoctial sunset over Creeve Hill summit.

(4.) "GIANT'S BED," INNISKIL (OR CROCKROWER).

About one mile to the westward of the standing stones just described, and at the western termination of the same hill-side, is a very much ruined monument bearing the above name. It consists of two small and six large stones, three of which, still standing in the ground, appear to

be *in situ*. The general direction of the ruin is, for the winter solstitial sunrise, perhaps over the cairn on Gollan Hill, which is in that alignment nearly from the monument.

The original form of the structure can now only be guessed at, and may have consisted of five large stones standing on their edges, including the three that are now found in that position, graduated upwards in height to the south-eastward, supporting four or more capstones—thus forming a series of small chambers, with a sloping roof, giving a line of direction and altitude.

The view from the ruin to the northward—namely, between east and north-west—is shut out by the crest of the hillside, on the slope of which it stands; but it is clear for the remainder of its horizon. If any sight-lines were employed in this direction—namely, to the southward, beyond the solstitial one on which it appears to have been laid out—there is now nothing to suggest them.

(*To be continued.*)

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Papers.

ANCIENT STONE MONUMENTS NEAR LOUGH SWILLY,
COUNTY DONEGAL, IRELAND.

BY CAPTAIN H. BOYLE SOMERVILLE, R.N., FELLOW.

(Continued from page 202.)

(5.) "GIANT'S BED," DRUMHALLAGH.

(Fig. II.)

THE road which crosses the Lehardan-Inniskil ridge near the three standing-stones runs straight down into the Drumhallagh valley, and then straight up the opposite slope towards Oughterlin and Glencross Hill. At about half a mile from the bottom of the valley on this slope, there is a small farmhouse among some young trees on the left-hand side of the road; and on the opposite side is a small field, in which, close to the road-side, stand the important megalithic remains known under the above name.

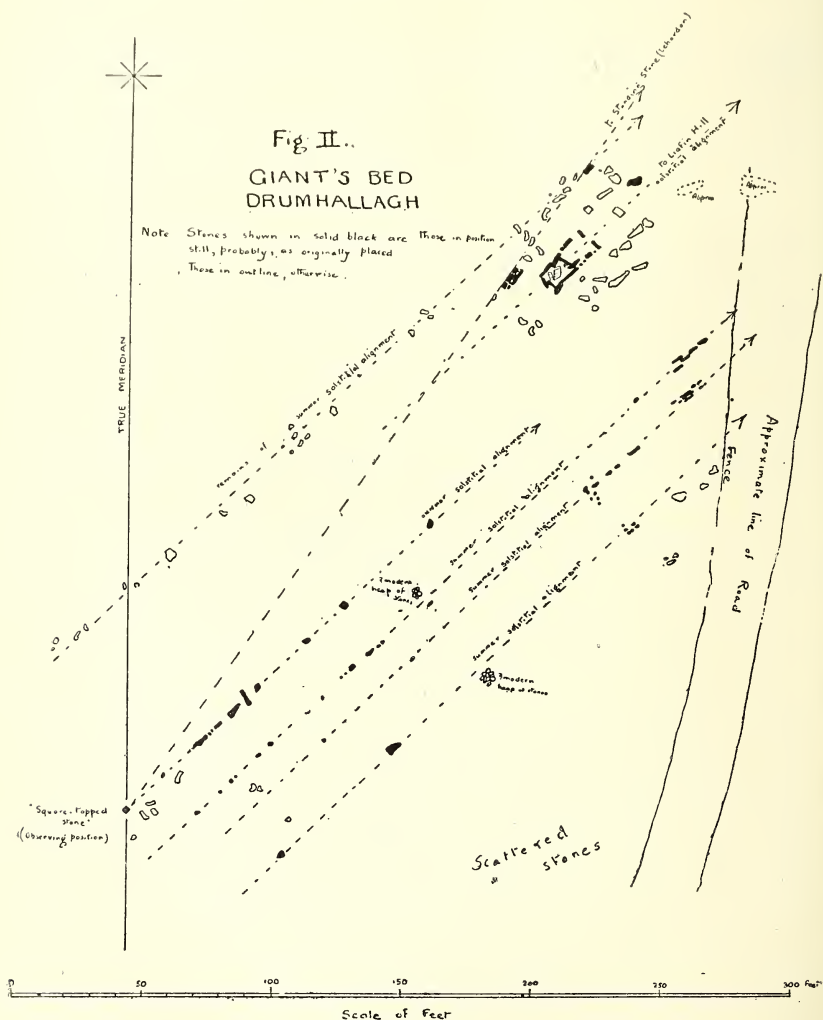
The structure was grievously wrecked by a party of "gentlemen" some years ago searching for gold, as I was informed at the farm-house; but a good deal still remains *in situ*, together with the remnants of at least four alignments of stones, each alignment being about 250 feet in length.

Several megaliths are to be seen in the surrounding walls, fences, and farm-buildings; and there are also large numbers of stones scattered

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in wild confusion in a field close by. These may be only a natural outcrop, but have some appearance of being ruins; their general direction being that of the "Giant's Bed" itself, though none of the remaining stones are so large, nor so obviously fashioned into shape by the hand of man.



The stones still standing of the latter consist of eleven large and several small fairly well-trimmed stone slabs and blocks, placed so as to form, as it were, two walls; with transverse slabs at the ends, and a dividing slab in the middle. The chambers thus formed (there may

have been originally more than two) were probably roofed with single large stones, one of which remains, but it has fallen into its "chamber."

Two of the stones of the "wall" stand on end, 6 feet and 4 feet 6 inches high respectively at the centre of the monument; the other stones lie on their long sides.

Along the north-western side of the main structure, and at a distance of 30 feet from it, is a short but clearly defined line of smallish stones, level with the present surface of the ground: 25 feet of this alignment remain intact, and have the appearance of the foundation of a wall of dry masonry. This is continued in a line of scattered stones (displaced, no doubt, by the treasure-hunters), and concludes in a large flat rectangular slab, evidently trimmed, and still in its original position, as its long side is in the precise line of the "masonry" part of the alignment.

At first sight I took this to be the remains of the edge of some sort of platform surrounding the large structure. I soon saw, however, that it was built at a different angle from the line of the upright stones; and on continuing the line of direction that it gave to the southward, I was brought to a well-trimmed, square-topped block of stone, now standing 20 inches out of the ground, and measuring 14 inches each way across the top, with quite rectangular corners.

On erecting the theodolite over the centre of this stone, I saw that the line thence to the northward, along the alignment from which I had just come, directed down hill to a large standing-stone, distant three quarters of a mile on the slope of Lehardan Hill, below the three stones.

The bearing of this line was N. $34^{\circ} 39'$ E., but what its significance may be I cannot say. The probability is that the sight-line was meant to be in the *opposite* direction, namely, upward from the standing-stone over the "Giant's Bed," to some point of the hill behind it. I regret to add that time and other circumstances did not permit me to visit the standing-stone to complete the investigation.

On continuing my observations at the square-topped stone mentioned above, I noticed, first, that the high stones forming the central feature of the "Bed" were in an exact line with the summit of Bulbin (see under "Cloghbane," *ante*, p. 198), bearing N. $38^{\circ} 13'$ E., and, next, that the square-topped stone was the termination of an avenue or alignment of stones running N. $46^{\circ} 30'$ E. Further examination revealed a second alignment parallel to the first one at a distance of about 80 feet to the northward; and two, if not three, more, all of similar character and the same azimuth, situated at 20, 32, and 55 feet respectively to the southward. The stones forming these alignments are in no cases large, and only a few of them bear signs of having been trimmed. One or two of them are raised about 14 inches above the ground; but the remainder are now flush with the surface.

I could find no signs of an alignment in continuation of the orientation of the main structure itself; but it is laid out on practically the same azimuth, namely, N. $47^{\circ} 54'$ E., so that all the alignments of stones are parallel to it. The sky-line on this bearing, which is formed by the summits of the Innishowen peninsula ranges of hills on the opposite shore of the Lough, distant 5 miles, has no conspicuous point; but the direction at the elevation of the sky-line is for the summer solstitial sunrise.

I may add that the line of direction of the "Bed" itself, which is also that of the summer solstitial sunrise, runs to the summit of a low, pointed-topped hill (below the sky-line), named Liafin Hill ("Grey Shrubbery"). I see on the Ordnance map that there are no less than five standing-stones and "Giants' Beds" surrounding this one small hill, so that it is evidently a place of archæological importance.

I now proceed to give the possible and probable astronomical events observed from the square-topped stone, which I am assuming to be the actual position of observation for the whole temple:—

NAME OF SUMMIT.	EVENT.	DECLINATION.	
		Upper limb.	Lower limb.
1. Orientation of the "Giant's Bed."	Summer solstitial sunrise.	$23^{\circ} 14' 12''$ N.	$23^{\circ} 42' 57''$ N.
2. All Alignments.	Same.	$23^{\circ} 52' 45''$ N.	$24^{\circ} 21' 38''$ N.
3. CROAGHAN.	Winter solstitial sunset.	$23^{\circ} 14' 10''$ S.	$22^{\circ} 47' 09''$ S.
4. MESKANMEAVE (Carn).	Equinox setting.	$2^{\circ} 32' 58''$ S.	$2^{\circ} 10' 09''$ S.
5. CROCKNAGLAGGAN.	November sunrise.	$14^{\circ} 53' 23''$ S.	$14^{\circ} 26' 11''$ S.
6. BULBIN (over "Giant's Bed").	(?) Star- or moon-rise.	$27^{\circ} 54' 34''$ N.	
7. CROCKFADDA.	Star rising.	$34^{\circ} 19' 00''$ N.	

Notes.—1 and 2. The slight difference observed between these declinations is probably due to the difficulty of recovering the exact azimuths of the original sight-lines, owing to the ruinous state of both "Bed" and alignments.

3. The hill-top that is on the southward view of the alignments is not the highest point of Croaghan Hill, but is a conspicuous, small, square-topped elevation, with a steep fall on each side. As there is no sign of a carn or other remains on it, this sight-line must come under the heading of "probable" only.

4. There is a large cairn on the summit of this small conical hill (not shown on the Ordnance map), which was also employed for a sight-line in the next monument that I shall describe; this fact of its employment for astronomical purposes from one place gives strong probability to similar use for it from another.

5. The November sunrise over Crocknaglaggan is over the same point as observed at Cloghbane, namely, "Crawford's Table," which is a large, isolated, naturally cubical block of stone on nearly the highest part of the ridge, and very conspicuous.

6. The rising star indicated by the sight-line over Bulbin might be Pollux, 1450 B.C., or it might also be the moon when at the extreme of its cycle of declination—a point that it reaches every 18·6 years.

7. The star sight-line over Crockfadda, which is a prominent peak of the Urris Hills on the eastern shore of the Lough, indicates either Arcturus in 850 B.C. or Capella in 1350 B.C.

(6.) "DRUID'S ALTAR," CROAGHAN HILL.

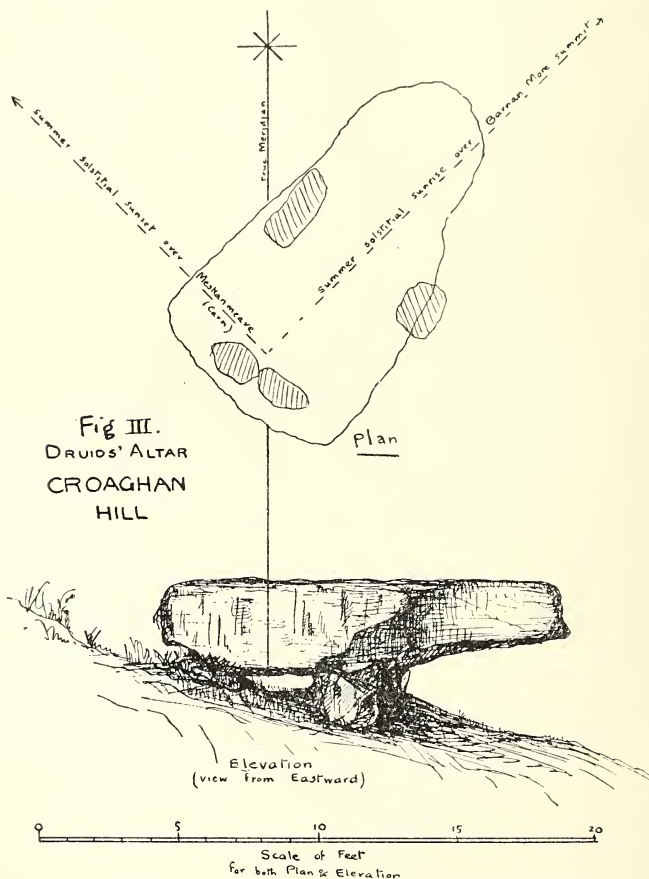
(Fig. III.)

On a wild mountain side on the northern slopes of Croaghan, and not far from its summit, is a very interesting dolmen, still apparently in its original position and condition.

A narrow buttress of the mountain here descends from the summit at a steep gradient, falling over into a rocky gully on the one side, and on the other more steeply still towards a small tarn named Garnahallowey Lough. The "Druid's Altar" is perched on the face of this buttress, and consists of one large, flat-surfaced stone, supported at three points on small stones in such a manner that it projects outwards from the steep slope, presenting a level table-top, with an angular space beneath, high enough for one to crawl under. Great care, skill, and knowledge have been exercised in its erection; for it is so exactly placed in this difficult position that the solstitial summer sunrise and sunset were both observed from it; the sunrise over the remarkable altar-like top of Barnan More, $10\frac{1}{2}$ miles distant; and the sunset over the cairn on the summit of Meskanmeave (? "Meave's Dish"), about 1 mile distant (*ante*, p. 215).

In considering the steepness of the slope at this point, the narrowness of the buttress of the mountain on which it stands, and the great weight of the stone—a triangular slab, 12 feet by 6 feet by 2 feet—we can only wonder what appliances were available to get it into so exact a position; no less than at the powers of observation and astronomical knowledge which indicated the site in the first instance. At a distance of 37 yards further up the same rough hill-side is a second large block of stones whose purpose or dimensions I had no time to investigate; but it is a

megalithic monument of some nature. It consists of a large boulder, roughly cubical in shape, which is reared up on one of its angular points, with the opposite one directed skywards, and supported in that attitude by two or three smallish blocks, acting as struts or wedges. I have never seen an illustration of such a structure; but it is certainly of human design, and was, indeed, pointed out to me as a "Druid Stone" by some countrymen who lived near.



I was shown also, not far away from this spot, a large natural boulder—a cube of 8 to 10 feet each way—with a flat top, which bears the name of "The Buck Stone." Whether it had a prehistoric purpose, I cannot say; but it gives its name to the valley which it overlooks.

There is also in this vicinity an interesting relic of comparatively modern times, namely, a small altar standing on a built platform of stones in a hidden and retired spot just off the mountain road, where the Mass was celebrated secretly in the days of the Penal Laws.

(7.) "DERMOT AND GRANIA'S BED," CREVARY.

(Fig. IV.)

This monument, which is at an easy distance from Rathmullan, is, in consequence, frequently visited, though its appearance is not particularly imposing.

It consists of two pillar-stones, the higher of which is 6 feet, and the lower 4 feet 6 inches in height, separated from one another by a stone slab, standing on its edge, 2 feet 6 inches high, and 3 feet 6 inches long. The shorter (western) of the standing-stones is in the line of a rough fence between two fields—a low earth fence containing several megaliths, which may once have formed part of the whole monument. At first I was greatly puzzled by these stones, as they gave the fence the appearance of an "alignment"; but after plotting my observations and working out the results, I am quite satisfied that such is not the case.

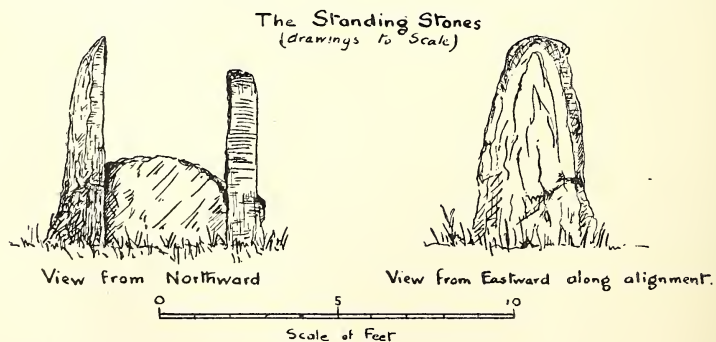
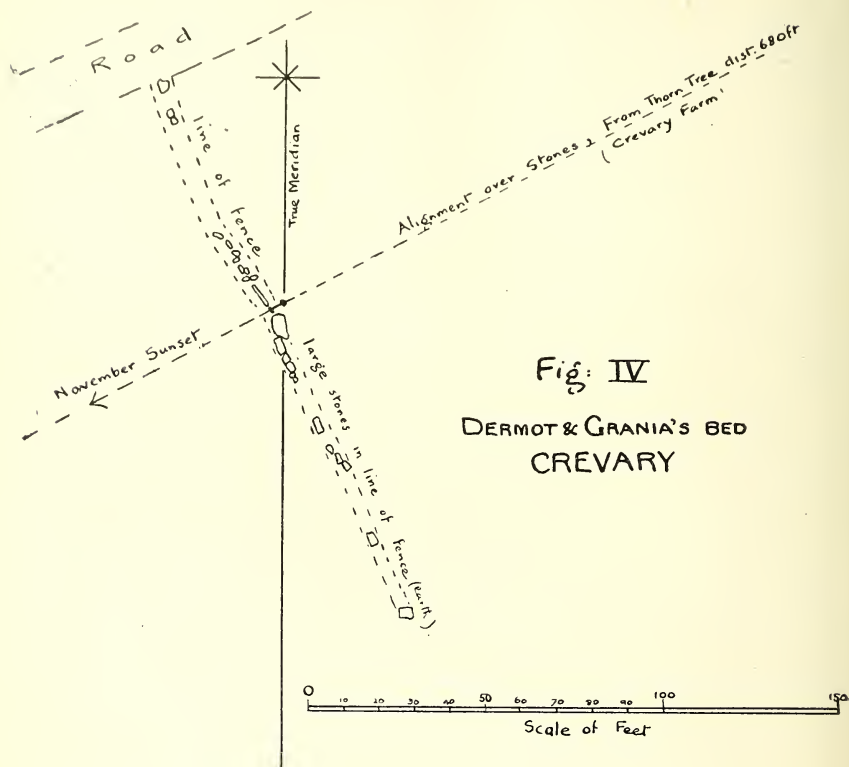
This monument was the only one to which I was not able to obtain a direct theodolite azimuth from an Ordnance trigonometrical station; and the bearings are dependent, therefore, on the correctness (which I do not suspect) of the compass-needle in the theodolite.

The field to the northward slopes downward from the stones; and at the end of it is the farmhouse of Crevary ("a branchy place"). The road runs by the side of this field to the farm; and as I was returning along it to Rathmullan, I happened to see a very large and ancient-looking thorn-tree growing in the rickyard of the farm. On going up to examine it (for some megaliths lay near), I noticed at once that from it the two standing-stones of the "Bed" were exactly in line, and that they stood up clear against the sky-line.

On erecting the theodolite, and obtaining the bearing and elevation, it became obvious that this was the ancient observation spot in connexion with the standing-stones; for the azimuth and elevation, when worked out, indicate the November sunset. Two confirmations of this discovery lie (1) in the fact that the top of the northern stone (the higher of the two, and that nearer to the thorn-tree) is bevelled off away from the observer, leaving a pointed top, something in the fashion of the foresight of a rifle, so as to permit of a better and more definite observation; and (2) in the fact that from the thorn-tree position the reverse azimuth to the stones' sight-line is to a distant peak on the Innishowen peninsula (named Grinlieve), and provides exactly the May sunrise sight-line—a double observation that would not be possible from any other spot.

A few days following my finding of this thorn-tree position, towards the end of October, I again visited the spot in the late afternoon, and had the satisfaction of actually seeing the Sun setting nearly on the

sight-line behind the standing-stones. A few days later, and the Samhuin sunset would have been *exactly* over them.



These facts raise an interesting botanical point, namely, as to the possible age to which the whitethorn-tree may live.

There is no doubt that the tree referred to above stands at the original point of observation of the May sunrise over Grinlieve, and of the November sunset over the standing-stones of "Dermot and Grania's Bed." I may add here that, from a second ancient thorn-tree which is growing in front of the Rectory Gate at Rathmullan, at the edge of the slope above the beach, I observed the Sun rising, on October 24th, almost exactly over the summit of Cashel Hill, on the opposite side of the Lough. The name of this summit clearly indicates the existence, or the former existence, of a carn or a cashel upon it; and I have no doubt that this Rathmullan thorn-tree is also the last survival of an ancient observatory of the November sunrise behind the Carn or Cashel Hill. (See also under "Dermot and Grania's Bed, Glenvar, *ante*, p. 197.)

Dr. Joyce, in "Irish Names of Places" (page 200), has a great deal of information on the subject of the May-November cult, which (according to the Book of Rights) was instituted by King Tuathal the Acceptable in the first century of our era at the hill of Usnagh in Westmeath. Christianity was established in Ireland by about the sixth century; and it can only be supposed, therefore, that these thorn-trees were planted at some time between these dates. It seems unlikely, to say the least of it, that a seed should in each case have taken root and sprung up *exactly* on the position of the original tree, nor can it be supposed that "pious" hands should have deliberately planted new trees on the death of the old from that date onward to modern times, for the purpose of, first a forbidden, and afterwards a forgotten, cult. It must be remarked also that the thorn-tree still possesses a "fairy" quality in the eyes of the Donegal people (no doubt the last relic of its former real sanctity); and this preserves these trees from being cut down or damaged in any way; even when they are placed, as not infrequently happens, in the middle of a ploughed field, where they must prove a serious inconvenience to the ploughman.

It will be noted that the position of the tree must be *precise* in order to obtain a correct sight-line of a sunrise or sunset over a second object, more particularly when they are so close as in this case, in which the distance of the thorn-tree from the aligning-stones is only 680 feet. It thus appears to be not unlikely that these trees have attained a very great age.

Besides the alignment for the November sunset and the May sunrise, there may also have been sight-lines over Gollan Hill summit (where there is an ancient carn) for the equinoctial sunrise; and perhaps for true north over Knocknagraw, a prominent, sharp-topped hill near by, which forms part of a farm-land named Carnafeagh ("the Carn of the Wood"). I have protracted these lines from the Ordnance map, as the actual observation of them is not now possible, owing to buildings, trees, &c., coming in the line. Neither of them is very satisfactory, and

must be regarded as "possibilities" only. The exact figures are appended:—

NAME OF SUMMIT.	EVENT.	DECLINATIONS.	
		Upper limb.	Lower limb.
GRINLIEVE (? "Sun mountain").	May sunrise.	14° 28' 03" N.	14° 57' 02" N.
Alignment of Stand- ing-stones D. and G.'s Bed.	November sunset.	13° 44' 44" S.	13° 17' 49" S.
GOLLAN HILL (Carn).	Equinox (?).	Bearing, N. 86° 30' E.	(?) Elevation.
KNOCKNAGRAW.	True North (?).	Bearing, N. 3° 30' W.	—

(8.) RAY POINT (Circle).

In the course of making the hydrographic survey of the coast of the lough, I came upon two prehistoric circles, on Ray Point and Ballykenny Point respectively. Neither of these is marked on the Ordnance maps, nor are they known by the country people living near them.

The first of these is in a flat, grass field, on the north side of the mouth of a small stream named Ballasallagh Burn. The district itself is named Ray (from a house of the name, close to the field in question), and may possibly have reference to a former Rath, such being the manner in which the name is occasionally spelt in English. It should be remarked, however, that in this case the word is locally pronounced as if it were spelt "Rye."

On the extreme of the Point there is a modern ruin, with a cottage built up against it, and in the centre of the field behind it is a circle (or, more properly, an oval), easily discernible, though it is grown over with grass, and is nowhere more than 12 to 18 inches in height above the ground, and from 2 to 3 feet in width. There are four or five largish stones, which probably formed part of the original structure, grouped unevenly at the northern end of it. It occurred to me at first that possibly the "Circle" was but the remains of the platform of a rick; but not only its oval form (a characteristic of these ancient structures that I have found repeated elsewhere in the locality), but also the large number of what appear to be undoubted sight-lines over various summits on its horizon—especially to the famous "Greenan Elagh"—must establish it as an ancient observation spot. The series of sight-lines observable

from it, of which I now propose to give the exact figures of the declinations, could scarcely be fortuitous :—

NAME OF SUMMIT.	EVENT.	DECLINATIONS.	
		Upper limb.	Lower limb.
GRINLIEVE (? "Sun mountain").	May sunrise.	16° 20' 38" N.	16° 49' 36" N.
SLATE HILL.	May sunset (?).	18° 42' 05" N.	19° 08' 00" N.
INCH TOP (Carn).	Equinox sunrise.	3° 01' 39" N.	3° 27' 53" N.
DRUMACLOGHAN ("Ridge of the Stone").	Equinox sunset.	0° 25' 12" N.	0° 51' 53" N.
GREENAN ELAGH.	November sunrise.	15° 02' 03" S.	14° 41' 47" S.
DRUMERIVE ("Ridge of the Bull").	November sunset.	14° 58' 45" S.	14° 31' 21" S.
CASTLE HILL (Ruined castle).	Winter solstice sun- rise (?).	24° 49' 41" S.	24° 23' 00" S.
TIRODDY.	Winter solstice sun- set (?).	24° 15' 22" S.	23° 44' 12" S.

Among the above sight-lines I should feel inclined to class as doubtful that of the May sunset over Slate Hill, and those of the winter solstice, sunrise and sunset. The declinations in themselves are correct, and the summits are well defined; but there is little evidence beyond this in their favour. The castle on Castle Hill is itself a ruin of mediæval days, I understand; but it may well occupy the position of an ancient carn, or prehistoric edifice, for the hill, though low, is isolated, and thus conspicuous. The top of Tiroddy is now occupied by modern farm-buildings, and that of Slate Hill has no visible "antiquity" on its sky-line. The remaining objects seem to be more worthy of belief, either from their names, or from the existing evidences of prehistoric remains on their summits. My translation of "Grinlieve" is little more than a guess; yet it seems a probable derivation. This summit was employed for the May sunrise from "Dermot and Grania's Bed," Crevary, also (*vide ante*, p. 223). The difference in its bearing from the two observatories is compensated for by the difference in its elevation, as seen from each, when calculating the declinations.

(9.) BALLYKENNY POINT (Circle and Alignments).

(Fig. V.)

The second set of previously unknown prehistoric stone remains, referred to above, lies not far from the Ray Circle, near the top of a prominent wooded point named Ballykenny, and at about 50 feet above the sea-level. There is an Ordnance trigonometrical station on this point; from which I was able to obtain correct azimuths, both for the remains close by, now to be described, and also for the Ray Circle, which is in sight from it. The Ballykenny Circle is situated on the northern side of the point, in a rough field, and consists of an oval of stones, both large and small, standing from 2 to 3 feet above the present surface of the soil, and enclosing a space full of scattered stones. A thicket of holly, mountain ash, and nut-bushes grows all over it; but it is possible to get within the oval at one or two points; and it is from the interior that the best view of the structure is obtained. Exteriorly it appears only as a patch of shrubs and small trees; but from the inside the complete enclosing "wall" of the oval is easily recognized.

Near this oval is a series of seven or eight large, untrimmed (?) stones, placed consecutively in a line, touching one another, and crested with shrubs. This appears to be the remains of, perhaps, a stone alignment, but is now only 30 feet long. Not far from this row of stones and the oval are the remains of a second alignment of stones, not quite parallel to the first, and of a different character. The terminal-stone is of cubical form, and has every appearance of having been trimmed to this shape. It stands 3 feet above the ground, and is 4 feet square at the top, thus presenting a small platform for an observer to stand upon. It is surrounded by a fringe of small holly bushes. Looking northward from this point, six more stones of the alignment remain in position, covering a distance of 210 feet. All are of fairly large size, the northernmost having the appearance of a fallen pillar-stone (but, I think, untrimmed), of unusual proportions. Several other large stones lie scattered about near this alignment, and in other parts of the field.

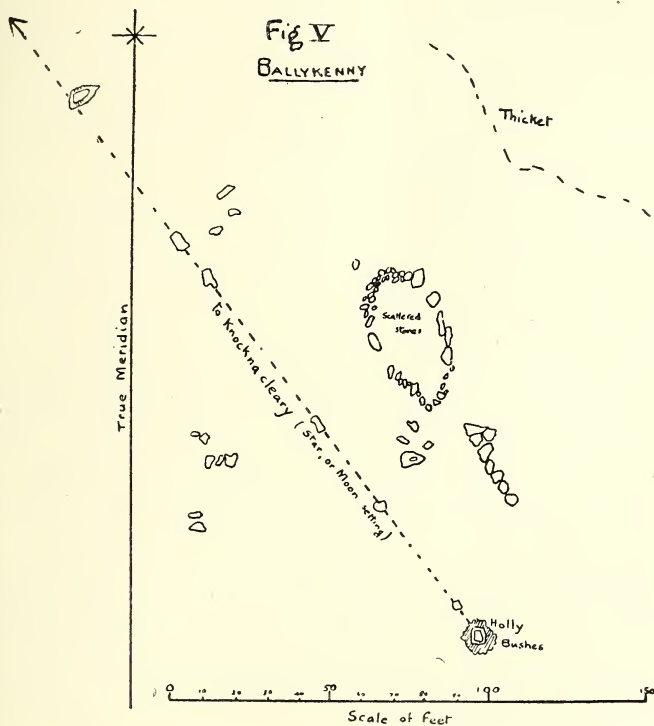
To the eastward the hill slopes to the shore of the lough, and is covered with a close thicket of nut, privet, alder, holly, and mountain ash, which begins on a line some twenty yards from the oval. Underneath this thicket are large numbers of scattered stones; but, until the shrubs have been cleared away, it would not be possible to say whether they are of any archæological significance.

The stone alignment described above directs to the summit of KNOCKNACLEARY HILL, about two miles distant; and the azimuth and altitude infer the declination of $29^{\circ} 09' 17''$ N. for a setting star, or,

¹ See notes on "Giant's Bed, Drumhallagh," p. 215; and "Templemoyle," p. 229, below.

perhaps, for the setting moon at its greatest declination. The star and its date might be :—Arcturus, 50 A.D. ; Pollux, 700 B.C. ; or Castor, 1900 B.C.

No clear indications of sight-lines can be found for the remaining ruins, either by observation or by protraction from the Ordnance map.



TURRUSBUNALLIA.

About half way between Ballykenny and Rathmullan are two holy wells bearing the above name (which may signify "the place of oak-trees by the mouth of the stream"), the "wells" being placed one on each side of the present main road. There is little to distinguish either of them ; and they would certainly be overlooked by a passer-by who did not know of their presence. There is a small stream running down from the hillside at this place. To the southward of it is a field, and to the northward a branch road leading into the mountains ; a short way up it is a cottage, with other buildings.

The stream passes under the main coast road through a large culvert, and there runs into the sea, which comes up to that point at high water ; and this "mouth of the stream" constitutes one of the "wells."

People afflicted with bodily ailments visit it at all seasons of the year (but on Fridays only), say their prayers, bathe the injured or crippled limb, and hope for a cure.

The other "well" is at the edge of the small field northward of the cottage, and about 20 yards in from the road. It consists of a block of stone, trimmed rectangularly, with dimensions of about 3 feet by 1 foot 6 inches by 1 foot, and has a saucer-like depression cut on its upper face, which will hold about a pint of water. It is, in fact, a "Bullaun."

The stone is propped up with other smaller stones, so that its surface is a couple of feet above the ground; a small collection of votive stones lies on top of it, and a briar bush grows over all, to which are attached rags, the offerings of visitors using the "well."

The rain-water that falls into the depression in the stone is used by those suffering from ailments of the eye, as a lotion (after prayers) for a restoration of eyesight, or for relief from disease.

This "well" is used, like the other, at all times of the year; but its efficacy is not confined to any particular day of the week, as in the case of the stream-mouth "well."

The surroundings of this spot will repay a more careful survey than I have been able to bestow; for megalithic and other prehistoric remains (not previously noticed, I believe) are to be seen in its vicinity, viz.:—

(1) The field to the northward of the "eye-well" has a large, rounded mound in it, which has every appearance of being artificial; and the tops of large stones can be seen in several places in the grass which covers it.

(2) Immediately behind the "eye-well" is a small, rough patch of ground in which it is possible to trace about half of the circumference—broken to seaward—of a circle of very large stones, evidently of high antiquity, amidst which are the stumps of five or six recently felled ash-trees(?), which must have been of great age and size, as the stools remaining are all of 3 to 4 feet in diameter.

(3) The outbuildings of the cottage are largely constructed of megaliths; and there are also what look like the remains of a stone circle among the trees just above it on the hill. There are, besides, two large, upright, trimmed stones, built into the fence alongside of one another, by the roadside near the cottage, which are almost certainly of archæological interest.

(4) But the field mentioned above as lying to the southward of the stream contains definite prehistoric remains; for there are in it three stone carns of small size, one of which surrounds the foot of an ancient mountain-ash tree; the second, that of an even more ancient thorn-tree (now, apparently, in a moribund condition), while the third, which is the largest, and takes the form of a circular platform rather than a carn, surrounds an enormous oak tree, with wide-spreading branches, evidently

of great age, which has a ring of holly bushes growing close round the trunk.

From this oak tree, the mountain-ash tree and its cairn are in line with the two large stones in the fence (3), the large artificial mound (1), and the "eye-well." This may be fortuitous, but seems worthy of notice. The bearing is roughly N. 78° E.

(10.) TEMPLEMOYLE (Standing-stones and Circle, &c.).

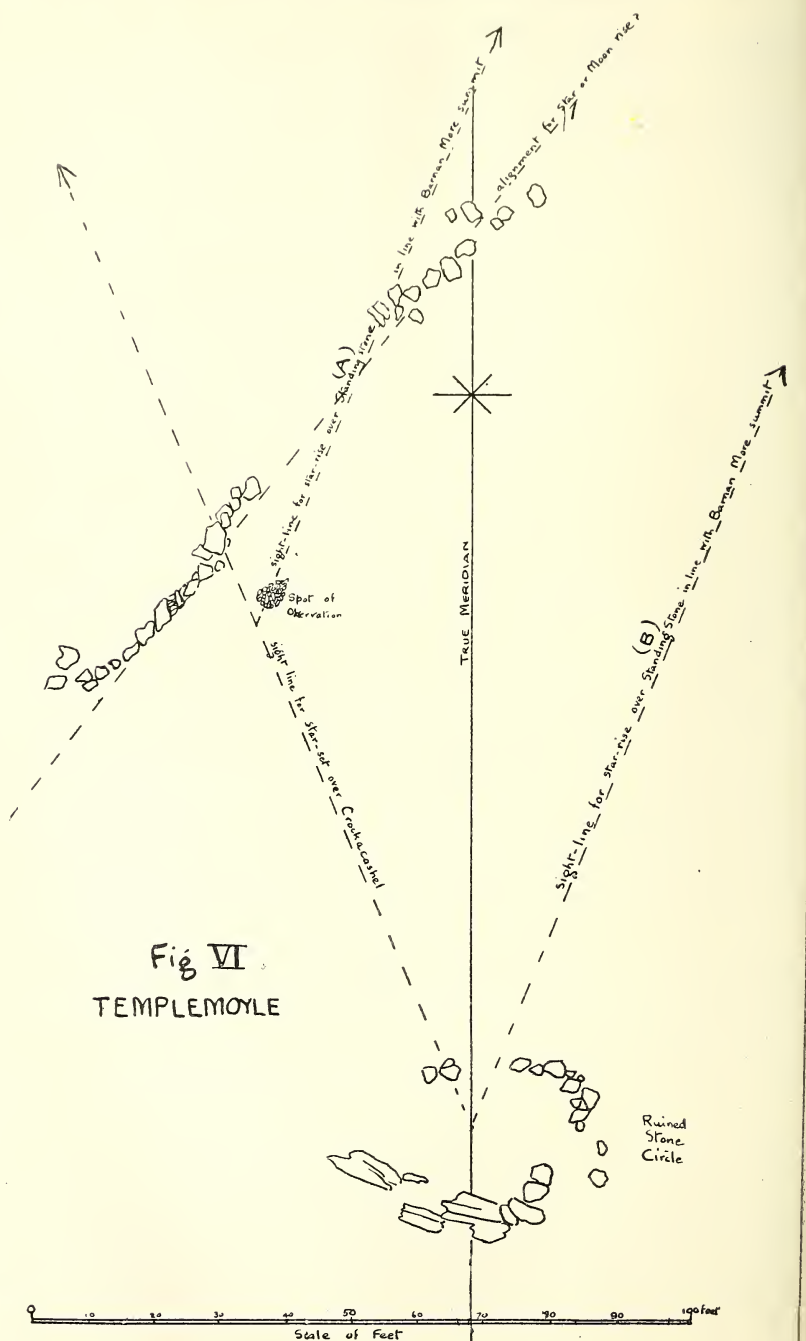
(Fig. VI.)

There are several archæological remains on the Buncrana side of Lough Swilly, within an easy distance of the town. Circumstances have prevented me from examining them more than cursorily, with the exception of that now to be described. The main part of the sight-line, namely, its observatory end, had not previously been discovered, and I found it almost by chance.

Upon the Ordnance maps there are shown near the farm-house of Templemoyle the positions of four standing-stones, in two groups of two stones each, the groups lying within close range of one another. As a matter of fact, only three of these four stones now remain in view: two close together in the fence of a field, and one by itself in the field close by.

These standing-stones differ greatly in appearance, and, I should say, also in antiquity. The two close together in the fence are of the stone of the adjoining country—a grey metamorphic rock—and are carefully trimmed, with a rectangular section, well-fashioned angles, and fairly smooth sides. They are of massive dimensions; the southern stone being 9 feet high, with sides 1 foot 3 inches and 1 foot 8 inches respectively; while the southern, though it is only 2 feet 6 inches in height, is 3 feet 6 inches long, and 1 foot 8 inches wide; it cannot be seen until one is close by, owing to shrubs surrounding it. The remaining standing-stone near, which has lost its mate, is of a darker quality of stone than those just described, and is of altogether ruder appearance; the facing is imperfect, the angles undermined, and it is more or less "knife-edged," with a triangular section.

Eastward of the Templemoyle farm the country rises into a steep, heather-clad hill, with patches of grass between rough strips of large boulders. After wandering about on this hillside, vainly trying to discover to what the line of the standing-stones might have been directed, I was giving up the search, and returning to Buncrana, when, on reaching the foot of the hill (where, below the boulder zone, there was a grass field), I noticed that one of the standing-stones had come into line with a very remarkable summit, named Barnan More, or Bin More ("The greater hill of the Gap"), once before referred to in these Notes (under "Druid's Altar," p. 219); for there are two somewhat similar



hill-tops, one higher than the other, between which lies a conspicuous gap.

The summit of this hill has the same appearance from all points of view, namely, that of a nearly flat-topped table, or altar, crowning the steep slopes of what would otherwise be a conical hill, and appears to have a large carn, or some prominence in its centre. It is one of the most striking mountain features in this very picturesque neighbourhood.

At the point where I noticed that the right-hand (the first described) standing-stone was in line with Barnan More, its table-like top was visible clear against the sky, but cut off from its own slopes by the nearer flat summit of Ballymagan Hill, a spot itself of historic interest. (See Dr. Joyce's "Irish Names of Places," p. 11).

The possibility of a sight-line struck me at once; and on looking around, I discovered that I was standing close to some large stones, which had every appearance of being a ruined stone circle. On placing myself at its centre, the coincidence of the standing-stone with the top of Barnan More became still more perfect. Part of the circle was composed of two or three large stones, placed in conjunction with a natural outcrop of rock, bearing in many places the sign of the "jumper," where pieces had been blasted off at various times. The other part of the circle was grown over with a low, thorny thicket, which being cut away, the ancient structure it had covered and protected became perfectly apparent.

Greatly interested by this discovery, I made further search near by, and soon discovered a small stone mound of a definite pear-shape, the point of which was to the north-eastward, also covered with low bushes, from which the left-hand standing-stone—that of more ancient appearance—was in an exact line with the centre of Barnan More.

By its side was an alignment of large stones, also pointing to the north-eastward, but at a different azimuth, constructed somewhat in the form of a low cyclopean wall, and obviously of a great age.

On visiting the place with a theodolite (having obtained an azimuth from it to the adjoining Ordnance trigonometrical station on Crockacashel), the meaning of the sight-line of the standing-stones with Barnan More was evolved. The direction and elevation are for the rising of the same star as that already observed at Cloghbane and Lehardan on the opposite shore of the Lough; and the setting of the same star was here provided for as well by a sight-line over Crockacashel, a hill-top where I found various prehistoric remains, to be described later. The star in question may have been either:—Castor, in 550 B.C.; Arcturus, 550 B.C.; Capella, 1720 B.C.

The sight-lines are for the same star for each of the standing-stones, but at different dates, not greatly separated in time; probably indicating that the sight-line had required readjustment, due to the altering bearing (through the precessional movement) of the star.

At the sight-line over the left-hand stone, from the pear-shaped mound, the declination was $32^{\circ} 51' 24''$ N.; and at that over the right-hand stone from the circle, it was $30^{\circ} 54' 58''$ N. If the first-named be assumed to be the older sight-line (as the appearance of its standing-stone indicated), this would mean, therefore, that the shifting of the observatory had been made on account of a star with an increasing declination, and would point to Arcturus in 550 B.C.; while if the shift took place in the opposite order, and on account of a star of decreasing declination, it would infer either Capella, 1700, or Castor, 556 B.C.

The declination of the star setting over Crockacashel is $32^{\circ} 25' 36''$ N., and must, I think, refer to the same star as was observed rising; but the figures do not assist us to decide which it was, nor as to its date.

The stone alignment, spoken of above, gives a declination of a rising star of $28^{\circ} 52' 31''$ N. This is the same star probably as observed at Ballykenny, Knocknacleary sight-line (p. 226), and at "Giant's Bed, Drumhallagh" (pp. 217 and 218, Bulbin sight-line), or else, as before suggested, for the Moon, at the extreme of its declination, either alone, or in conjunction with the constellation Gemini, between the dates 1000 and 2000 B.C., Pollux being indicated at the first-named date, and Castor at the other, and more remote.

There is an ancient thorn-tree, with the remains of a cairn at its foot, not far from the stone remains above described. I set the theodolite up beneath it; but either the sight-line has now been obliterated, or the position of the tree is a chance one (though I do not think so), for I could obtain no azimuths that appeared to be of any astronomical purport.

There is an old and disused graveyard in the vicinity—a mere collection of unmarked mounds at one side of an arable field—which may have had some connexion with the other remains, but the present highly appropriate name of the farm land, "Templemoyle"—"the Ruined Teampull"—seems to point with some certainty to the existence at this point of a place of sanctity or worship in former days.

CROCKACASHEL.

(Cashel and Stone Circles.)

A little northward of Buncrana there is a somewhat prominent hill rising from the rocky shore into a double summit. The seaward of these two summits is named Crockacashel ("the Hill of the Cashel"), for its rocky and heathery top is encircled by an ancient stone fortification or cashel, much broken away at the steeper parts, but in moderate preservation for about half of its perimeter.

The Ordnance trigonometrical station employed in finding the azimuth of Templemoyle is on the highest part within the circle of this cashel, and, as before noted, the setting of a star was observed from Templemoyle over this summit.

In the saddle between the two tops of the hill and close outside the wall of the cashel there are six small stone circles, each perfect or nearly so, but low, and composed of comparatively small stones, all untrimmed. It seems likely that they are the burial-places of chiefs or of other defenders of the cashel in some ancient battle.

PORTHAW (HOLY WELL).

(“The bank or landing-place of the battle”).

At the foot of Crockacashel, towards Buncrana, there is a small stream, and close to where it falls into the sea there are the ruins of some (modern) cottages, built in a straight row. Immediately behind the innermost of these and by the side of the little stream is a holy well. A low wall divides the well from the stream, and then bends round in horse-shoe form, enclosing the well on its northern, eastern, and southern sides. The other side, that to the westward, close to the end wall of the cottages, appears to have been straight. The top of the masonry is flat, and looks as if it had been used as a path for walking round the well. The well itself is 3 or 4 feet deep, about 6 feet across, and is at present filled with rubbish. There was no water visible in it; and as there were no rags or other votive offerings near it, it is probably no longer in use.

In the field to the southward of the well, there are four stone mounds or carns, with the remains of a stone circle at the southern end, all, except the latter, crested with low oak shrubs. The circle and carns are placed roughly equidistant from one another, and all are in the same line—namely, on the azimuth of N. 14° E.

In the eastward side of the field are two thickets chiefly composed of oak, ash, mountain-ash, and thorn; beneath which are confused heaps of stones, and one or two longitudinal heaps, resembling graves. These and the carns in the field seem worthy of further investigation.

By protraction from the Ordnance map, I see that the November sunset could have been observed from the stone circle mentioned above, over Crawford's Table, on the crest of Crocknaglaggan (*vide ante*, p. 198); and it is possible that there may be other sight-lines.

A little to the northward of the holy well, on the edge of the coast, is an ancient grave, at present adorned with a wooden cross, on which is inscribed “Father Hegarty's Grave”; but as it is obviously unconsecrated ground, this is either a traditional name, or else intended to be a joke. The point of rocks in the sea just beneath is named “Hegarty's Point” on the map. The near association of Crockacashel, its circles, this grave, and the holy well, with its stone mounds, taken into account with the suggestive name of the latter (Porthaw), all seem to point to some ancient warlike attack at this point, and the results of the slaughter that took place.

(*To be continued.*)

ANCIENT STONE MONUMENTS NEAR LOUGH SWILLY, COUNTY DONEGAL, IRELAND.

BY CAPTAIN H. BOYLE SOMERVILLE, R.N., FELLOW.

(Continued from page 233.)

DISCUSSION ON THE LOUGH SWILLY MONUMENTS AND SIGHT-LINES.

IN the above notes, the sight-lines of ten of the ancient pagan observatories have been described, and tabulations given of the declinations inferred from their azimuths, and the altitudes of the skyline. There are in the neighbourhood of the lough probably about five times the above-mentioned number of these stone remains still requiring scientific investigation; but, even so, it may be not unprofitable to generalize a little on the observations here set down, beginning with some attempt at classification.

The classification that I propose to make is not one dealing with the particular form of monument or arrangement of sight-line, but solely on the astronomic observation for which each has been constructed. The divisions that I would propose are as follows, and refer to the direction of the rising or the setting of the heavenly body in question—either or both. Those that I do not consider to be certainties, I mark as such, with a note of interrogation (?) :—

I.—SOLSTITIAL.

Cloghbane.
Giant's Bed, Inniskil. (?)
Giant's Bed, Drumhallagh.
Druid's Altar, Croaghan Hill.

II.—EQUINOCTIAL.

Giant's Bed, Drumhallagh.
Ray Point, Circle.

III.—“ MAY-YEAR.”

Dermot and Grania's Bed, Glenvar. (?)
Dermot and Grania's Bed, Crevary.
Ray Point, Circle.

IV.—STELLAR.

Cloghbane.
Standing Stones, Lehardan Hill.
Giant's Bed, Drumhallagh.
Ballykenny, Alignment. (?)
Templemoyle.

V.—LUNAR, OR LUNI-STELLAR.

Giant's Bed, Drumhallagh.

Ballykenny, Alignment.

Templemoyle.

(This last classification is put forward tentatively, and only to suggest the possibility of lunar observations having been made at them.)

It will thus be seen that some of the observatories combined two or more purposes; namely:—

Cloghbane is both solstitial and stellar.

Giant's Bed, Drumhallagh, is solstitial, equinoctial, luni-stellar, stellar, and (doubtfully) for May-year also.

Ray Point Circle is May-year, equinoctial, and (doubtfully) solstitial.

Templemoyle is both stellar and luni-stellar.

Among these it will be noticed further that the equinoctial lines are always in combination with other solar observations; and that there is doubtfulness as to the combination of both solstitial and "May-year" observations at the same "temple," though the *possibility* of it occurs at two positions, Drumhallagh and Ray Point.

I have referred above, p. 223, to the historically recorded date of the introduction into Ireland of the May-year worship; which was itself so closely followed by the arrival of Christianity, that it appears that in this island, in any case, the solstitial was the earlier cult, which the "May" worship either displaced or augmented. The latter supposition seems to be the more probable, judging by the facts that both the solstitial days *as well as* the May and November days became days of Christian observance; showing that both descriptions of pagan feasts required to be recognized in the general conversion to the new faith.

In this mountainous country it is possible that, from the ancient solstitial observatories, convenient summits might have been found already existing, but not before employed, over which might have been observed the sunrises or sunsets proper to the May-year observances, as well as those for which it was originally established.

And similarly solstitial alignments may have been also arranged for in the newer observatories, laid out principally for May-year festivals. There is no obvious reason why the two cults should have been in conflict; the May-year sight-lines are, indeed, but an extension of those employed for solstitial observation, providing four new calendrical dates to mark time or assist agriculture. The principle is the same in both; so that there seems to be no reason why both descriptions of sight-lines should not be found from a single "temple," just as we see (above) that equinoctial sight-lines are found to occur in both solstitial and in May-year observatories.

THE SOLSTITIAL ALIGNMENTS.

The fact has been noted recently that the solstitial alignments of the cromlechs of North Wales do not provide the exact day of the solstice, but generally the sunrise of a date a little earlier and later.¹ The solstitial alignments at Lough Swilly do not appear to have this peculiarity; the indication, indeed, is, if anything, for a declination to the northward in the summer, and to the southward in the winter, of the true solstitial declination. At Cloghbane, where the best and most accurate sight-line of this nature was obtained, the question rests on the point of whether the incidence of the upper or of the lower limb of the Sun with the top of the mountain peak was the moment of observation.²

It seems at least probable that the observation required by the cult was that of the Sun's *entire* disc; i.e., when the lower limb was apparently resting on the summit of observation, both at rising and at setting. This at least is the pictured representation of the luminary in the Eastern countries where Sun-worship of a similar nature to that apparently practised in Ireland was prevalent. The matter can only be settled by further accurate observations of well-defined solstitial sight-lines.

THE "MAY-YEAR" ALIGNMENTS.

The even division of the periods between equinoxes and solstices is when the Sun's declination is at $16^{\circ} 20'$ N. or S.; and it is on those dates, namely, May 6th, August 8th, November 8th, and February 4th, or near them, that the necessary observations should have been made.

In the May-year observatories investigated above, in which certainty as to alignments is justified, it is noticeable that in four cases out of five the inferred declination is less than the expected $16^{\circ} 20'$. Thus; at Dermot and Grania's Bed, Crevary, the date appertaining to the declination of the "November" sunset is October 29th or 30th; and for the "May" sunrise, it is April 30th or May 1st; namely, 8 days or 5 days respectively earlier than they "properly" should be. Also, in the case of Ray Point Circle, while the May sunrise is aligned for on the "correct" day, namely, May 6th or 7th, both the November sunrise and the November sunset are aligned for November 2nd or 3rd; or 5 days earlier than the strict date.

THE EQUINOCTIAL ALIGNMENTS.

As regards the observation of the equinoctial sunrise, the establishment of the necessary sight-line seems to be fairly certain at Drumhallagh and at Ray Point Circle; though here again, it is noticeable that exactness was not reached, possibly owing to the rapid movement of the Sun in its declination at these moments.

¹ See *Nature*, October 22nd, 1908, "Some Cromlechs in North Wales," by Sir Norman Lockyer.

² See note, p. 200, *supra*.

The correct dates of the equinoxes are March 21st and September 23rd; while at Drumhallagh the dates inferred are for the setting Sun on March 14th and September 29th; and at Ray Point, for sunrise on March 28th and September 14th, also for sunset on March 22nd and September 21st, these last dates being, as will be seen, a close approximation to the correct ones.

THE STELLAR ALIGNMENTS.

The sight-lines for the stars of this locality are of considerable interest; because at four separate observatories, an alignment to the same star is indicated, and at about the same century; while at one of them there is provision for star-set as well as star-rise, pointing to its probable use as a clock-star during the part of the year when it was visible all night.

It will tend to clearness to show these star declinations in a collected form:—

NAME OF SUMMIT.	EVENT.	DECLINATION.
CLOGHBANE.	Rising star.	32° 08' 40" N.
LEHARDAN (Standing-Stones).	Do.	32° 37' 15" N.
TEMPLEMOYLE.	Do.	32° 51' 24" N., and 32° 54' 58" N.
Do.	Setting star.	32° 25' 36" N.

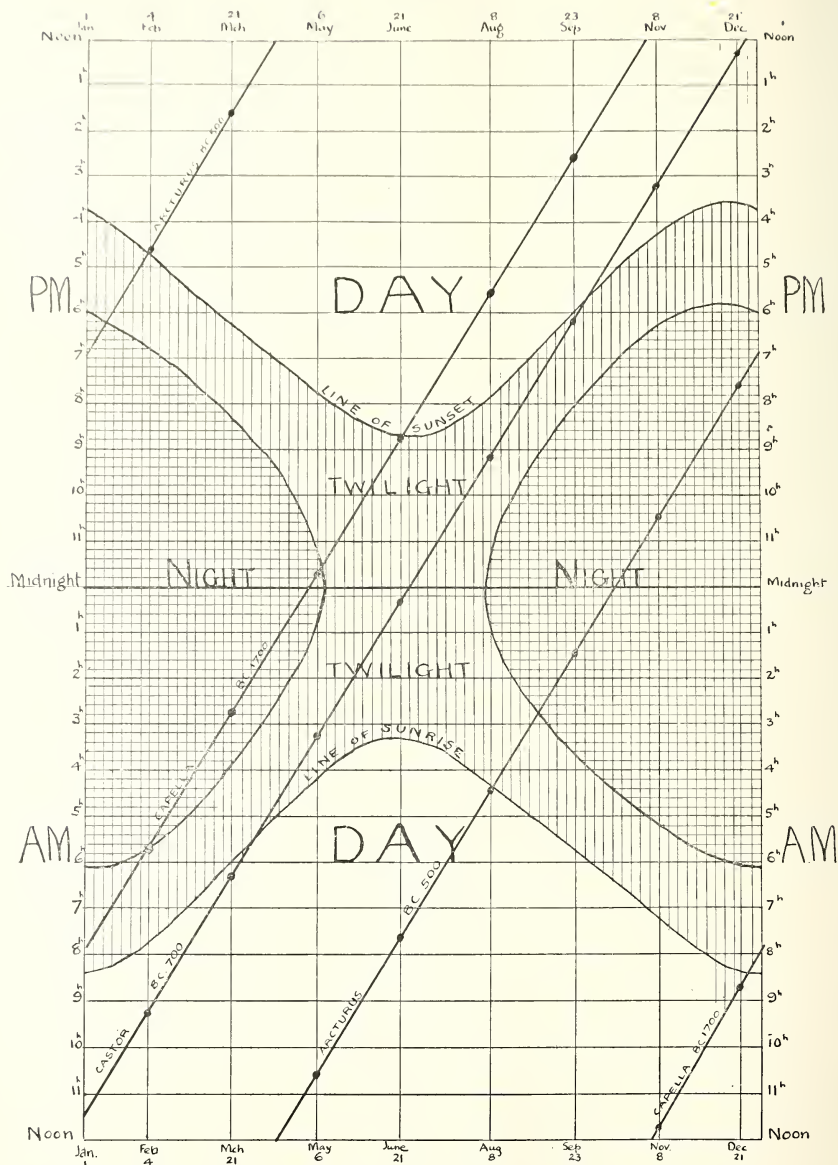
Note.—There are two sight-lines at Templemoyle for the same rising star, the alignment having apparently been shifted in order to suit the alteration in rising azimuth, as the declination changed (see pp. 231, 232).

These figures point to either of the following rising stars at the dates named:—

—	CLOGHBANE.	LEHARDAN.	TEMPLEMOYLE.
	B.C.	B.C.	B.C.
Arcturus, . . .	450	500	550
Castor, . . .	850	700	550
Capella, . . .	1800	1750	1700

They might also point, but less probably (these being stars of the second magnitude), for α Persei between B.C. 1500 and 1550, or for β Leonis between B.C. 1600 and 1750.

Conditions of Star risings throughout the Year in Lat 55° N



Perpendicular lines indicate the date of the year
Horizontal lines the hour, AM, or PM, of the day

The conditions of daylight, twilight, and darkness on each day throughout the year are indicated by curves and shading

The time of rising of each of the stars referred to in the text at the dates named, is indicated by the horizontal line on which the diagonal line appropriate to the star, cuts the perpendicular representing the date

E.g. The time of rising of Arcturus on June 21st, R.A. 500, was 7^h 37^m A.M.

To these should, perhaps, be added a stellar alignment at the Giant's Bed, Drumhallagh, which infers a declination of $34^{\circ} 19' 00''$ N. ; and would be directed to the rising of Arcturus in B.C. 850, or of Capella in B.C. 1350, which indicates that this sight-line was laid out four centuries earlier or later than the others, according to the star employed.

The conditions must, therefore, be considered on other grounds. If the reasons for observing the risings and settings of stars by the ancients in Ireland are to be taken as the same as those which governed these observations in Egypt and other eastern countries possessing an "astro-nomical" religious cult, we must suppose (1) that the risings or settings of stars were used to "herald" the sunrise on one of the required dates, or (2) that the stars were used to indicate, by their position in the heavens, as they circled round the Pole, the time at night during the part of the year when the star was in sight during hours of darkness. It must first be noted that stars do not rise at the same time every day throughout a year. Owing to the difference in length of a sidereal year and a mean solar year, the rising of any particular star takes place about four minutes earlier, each time it appears above the horizon. It is therefore obvious that during part of a year it must rise in daylight, during another part in twilight, and during the rest in darkness.

The accompanying diagram presents the daylight, twilight, and dark hours throughout a year in the latitude of Lough Swilly; and, together with these, the times of rising of Arcturus in B.C. 500, of Castor in B.C. 700, and of Capella in B.C. 1700, at which date each of these stars had a declination of 33° N. No other bright star had this declination in "pre-historic" times, so we are thus limited to one of them (with its appropriate date) for the date of the establishment of the monument to which it belongs.

It must also be noted that the conditions depicted in the diagram, both of sunrise and star-rise (or settings), apply only to places in the latitude of 55° N., and a star of declination of 33° N., which suitably fulfilled "heralding" conditions at that latitude—for instance, at Lough Swilly—might not do so in Cornwall, latitude $51^{\circ} 30'$ N., and *vice versa*.

An inspection of the diagram will show that the rising of Arcturus in B.C. 500 could not have been used at all as a "heralding" star at any of the required dates of the solar year.

Castor in B.C. 700 heralded the sunrise of Bealtaine (May 6th).

Castor in B.C. 700 heralded the sunset of Foghmhar (August 8th).

Castor in B.C. 700 announced midnight at the summer solstice.

Capella in 1700 B.C. heralded the sunrise of Earrach (February 4th); and possibly, but doubtfully (as the interval of time between the star-rise and sunrise was so great), the sunrise at the Equinox (March 21st); and still more doubtfully, that of Bealtaine (May 6th).

The probabilities, therefore, seem to rest with Castor in B.C. 700; and I should feel disposed to say that its midnight rising at the summer solstice

was the event it marked, because at Cloghbane, where the Sun and this star sight-line are definitely combined, that of the Sun is for the summer solstice sunrise, so that it seems likely that the star observation also *was* in connexion with the date of that event. This is especially likely if it be the case that the May-year worship was not instituted in Ireland before the first century A.D., for thus the heralding by a star of May-year events would not be looked for in B.C. 700. But if, on the other hand, the May-year worship *was* in vogue in early times, and the institution by King Tuathal was only a revival of it, then Castor is still the more probable star (*vide supra*), together with its date.

I may note that in England many sight-lines have been found, directed to a rising star with a declination of 33° N.; which, being the same declination as that found by me at three places in Lough Swilly monuments, is practically certain to refer to the same object.

It is conceivable that the introducers of the cult of the stars brought with them the worship of this star (whichever it was) merely as a sacred star, and quite irrespective of its suitability as a "herald" in a latitude differing from that in which the cult arose,—Egypt, for example,—where its sanctity had been established; and we are, in such case, still at a loss in deciding the antiquity of these monuments.

It may also be that the "heralding of the sunrise" on any date is (for Ireland) a mistaken supposition; and that the star-rise sight-lines, over sepulchred hill-tops, &c., point only to a combined cult of the dead with that of the stars; but without, necessarily, any reference to the sunrise, or the time of year.

THE LUNI-STELLAR ALIGNMENTS.

Reference has before been made to the possibility of alignments being laid out for the rising Moon, at the extreme of its declinational path (p. 219, Drumhallagh, note 6; p. 227, Ballykenny; p. 232, Templemoyle). The inferred declinations from the alignments at these positions are as follows:—

Drumhallagh, $27^{\circ} 54' 34''$ N. (rising body).

Ballykenny, $29^{\circ} 09' 17''$ N. (setting body).

Templemoyle, $28^{\circ} 52' 31''$ N. (rising body).

First, as regards the Moon, it should be said that the lunar orbit is inclined to the ecliptic (or Earth's orbit) at an angle of about $5^{\circ} 09'$; that is to say, that the Moon's tropical or greatest declination varies from about $28^{\circ} 36'$ N. or S. to about $18^{\circ} 18'$ N. or S., attaining either of these extremes once in 18.6 years.

It seems at least likely that observers of the movements of the Sun and stars, such as the ancient Irish seem to have been, should also have observed the positions of moonrise as regards the horizon, especially as it

is well known how universal was the custom of employing the Moon for calendrical purposes, not only to mark months, but also, in conjunction with the stars and solstices, to mark years and cycles of years.

It will be seen how closely the three declinations tabulated above approach to the extreme lunar declination of $28^{\circ} 36'$; and I would suggest that we have here some evidence of the employment of the Moon for marking a cycle of eighteen or nineteen years, the "Metonic Cycle" of classical times in Greece.

If the alignment was stellar, it then refers to either Castor or Pollux at dates as follows:—

Drumhallagh,	Pollux,	1500 B.C.	Castor,	2200 B.C.
Ballykenny,	„	800 „	„	1850 „
Templemoyle,	„	1000 „	„	2000 „

There is thus also the possibility of the *conjunction* being looked for of the rising Moon with the constellation Gemini; but the evidence is still too dim to be of much use; nor is there any knowledge of the use of the zodiacal signs in Ireland in early ages. Such an observation would be of great value as marking a luni-sidereal cycle with considerable exactness; but the idea is here put forward in the most tentative manner and merely as a suggestion.

I hope during this year (1909) to add a few more observations to those given in the foregoing paper; but the field of research which lies round the beautiful shores of Lough Swilly will then have been opened up only in the most rudimentary manner. The ruined remains of antiquity lie in almost every field and fence awaiting investigation; and I heartily commend to archæologists this interesting country for a summer's visit in which to take compass or theodolite through its hills and vales, searching for these long-forgotten monuments of an unremembered creed.